# Women in Educational Technology:
# Content Analysis of AACE Journals 2004-2007

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Professional qualifications for men and women are equivalent across disciplines, however, women tend to be underrepresented in technology-related fields. The purpose of this study is to analyze the content of seven journals published by the Association for the Advancement of Computing in Education (AACE) to explore women's publications in educational technology. Using both classification codes from Waxman, Connell, and Gray (2002) and AACE, a content analysis of 702 articles was completed. Data show that, while women are closing the gender gap, there is still considerable progress to be made.

Professional qualifications for men and women are equivalent across disciplines; however, women tend to be underrepresented in most fields. Some contend that gender differences in higher education "arise from everyday discourse, which habitually uses oppositions such as masculinity/femininity and arts/sciences" (Thomas, 1990, p.10). A recent study showed that men dominated 11 out of 21 fields, including agriculture, natural resources and conservation, architecture, biological and biomedical sciences, business management and marketing, computer and information sciences, engineer-

ing and engineering technologies, legal professions and studies, physical sciences and science technologies, social sciences and history, and theological and religious vocations. Fields not dominated by men included education, health sciences, gender studies, communications, English and foreign literature, psychology, social services, visual/performing arts, and family services (National Center for Education Statistics [NCES], 2005a). Of the four fields closely linked to Educational Technology, three were dominated by women, including communication technologies, psychology, and education, indicating that women should be at least equally represented in Educational Technology. The increase of women in applied information technology fields, such as information science and information technology (Randall, Price, & Reichgelt, 2003) further supports the notion that women should be equally represented in Educational Technology.

According to the Commission on Professionals in Science and Technology (2004), women's representation in computer-related jobs is lower today than it was in 1983. The National Science Foundation (2007) recently confirmed that the number of women in computer-related fields has decreased. This is a concern for the future of women's professional progress and results in a lack of diversity in creativity and output for the fields of science and technology (Jackson, 2006; Margolis & Fisher, 2002; National Center for Women and Information Technology, 2005). This finding has potential implications for the representation of men and women's perspectives in the multidisciplinary field of Educational Technology.

One way to explore gender representation in a field is to analyze the literature produced by the scholarly community. For example, a content analysis of the Journal of Distance Education reported no significant difference in the number of male or female first authors (Rourke & Szabo, 2002). Additionally, Foley, Keener, and Branch (1994) analyzed instructional technology journals during a five-year period (1988-1992) and found that women writing in the instructional technology journals were mainly writing about topics that were not technological in nature; the articles focused more on how technology was helping students learn in the K-12 environment.

The purpose of this study is to explore women's publications in Educational Technology through a content analysis of seven journals published by the Association for the Advancement of Computing in Education (AACE). The following question guided this investigation:

What are the differences between AACE educational technology publications written by men and women first authors in terms of the methods they use, the participants they study, and the environment in which they conduct their research?

## LITERATURE REVIEW

The literature in this section is related to women in degree programs, in academia, and in literature, all of which have an impact on where and what women publish.

Where women settle professionally rests a great deal on their academic careers. To understand the progression, information pertaining to the representation of women in degree programs was reviewed. The NCES (2005c) reported the number of degrees that were conferred by gender in the U.S. Women dominated both the bachelor degrees (57.5%) and master's degrees awarded in 2003 (58.8%) but did not dominate the doctoral degrees (47.1%). That same report published in 1994 showed women Ph.D. recipients at 37.3%, so there is a visible increase in women completing advanced graduate degrees, although they still lag behind men. This is important because, even though more women (51.3%) than men (48.7%) graduate from high school (NCES, 2005b), their contributions and perspectives are underrepresented in graduate education.

One possible factor for the doctoral disparity, as explained by Maher, Ford and Thompson (2004), is that, while the number of doctoral degrees earned by women have increased, the time it takes women to complete their degrees has increased as well. Some may not complete their degree for different reasons. Two main reasons include the availability of financial aid (Abedi & Benkin, 1987; Baird, 1997; Bowen & Rudenstine, 1992; Tuckman, Coyle, & Bae, 1990; Wilson, 1965) and the relationships that women have with their mentors/advisors (Smith, 1995). In addition, Maher et al. found that time and family responsibilities were two other factors for women not completing their doctoral degrees. Jacobs (1996) added that many women, due to these parameters are forced to pursue their degree part-time, which she says is an acceptable status at "lower status institutions" (p. 155), but is likely to hinder degree completion at highly competitive institutions. These parameters are not the same as those expressed by men as factors influencing their degree completion.

Those women who do graduate move from preparatory to professional roles in academia. Similar to the disparities seen in enrollment in degree programs are those in higher education faculty. These have been well-documented in the literature. Findings from Glover and Parsad (2003) present the percentage distribution of full-time instructional faculty and staff in four-year institutions by gender and program for the year 1998. Data show that, out of nine areas, males dominated eight, including: (a) agriculture/home economics, (b) business, (c) engineering, (d) fine arts, (e) health sciences,

(f) humanities, (g) natural sciences, and (h) social sciences. The one field, education, which women dominated was only by 8.2%.

Additional data from the National Center for Education Statistics (Bradburn & Sikora, 2002) are shown in the bulleted list below. These data highlight a few key gender differences among faculty in higher education. These factors could deter women from wanting to pursue professorships.

- men's salaries ($61,700) were higher than women's ($48,400);
- men held higher ranks, on average;
- men were more likely to have tenure;
- men were much more likely to be full professors;
- women were more likely to hold jobs that were not tenure track positions;
- men were more likely to teach in the natural sciences and engineering; and
- women were more likely to teach in health/social sciences and education.

In addition to the above stated disparities, there is much research that examines reasons for why women are deterred from working in academia, including hiring patterns (Tolbert & Oberfield, 1991; Konrad & Pfeffer, 1991; Bowen & Schuster, 1986; Bach & Perrucci, 1984), promotion ranges (Hurlbert & Rosenfeld, 1992; Long, Allison, & McGinnis, 1993; Long & Fox, 1995), publication rates (Ward & Grant, 1995), mobility from one institution to another (Rosenfeld, 1987), job satisfaction (Tack & Patitu, 1992), turnover (Tolbert, Simmons, Andrews, & Rhee, 1995), salaries (Bellas, 1994; Tolbert, 1986; Fox, 1981; Bowen & Schuster, 1986; Astin & Snyder, 1982; Langton & Pfeffer, 1994), and a feeling of marginalization, both personally and professionally (Aisenberg & Harrington, 1988). Bjorkman, Christoff, Palm, and Vallin (1998) emphasized the positive side by reporting that women in their study, while they still have issues adjusting to male-dominated fields, have discovered their ability to acculturate themselves alongside their male counterparts. Some studies concluded that women did not want to maintain their place in the higher status field that required a work-focus mentality (Hearn & Olzak, 1981).

In short, many women appear to be determining that academic careers are not compatible with their ideas of desirable lifestyles. This decision robs many academic fields of potentially powerful contributions as well as a gender-balanced perspective in the academic literature produced by the male-

dominated fields.

While data show that women are underrepresented in higher education, data also suggest Educational Technology may be a field in which women are equally represented due to its connections to female-dominated fields such as psychology, education and communication (NCES, 2005a), and the increase of women in applied technology fields (Randall, Price, & Reichgelt, 2003). This study explores gender representation in Educational Technology by analyzing literature produced by a portion of its scholarly community.

## METHODS

This study analyzed the content of 702 articles, published between 2004-2007, in seven AACE journals to explore gender representations in Educational Technology literature.

### Data Collection

AACE journals were selected because of their reputation for advancing Educational Technology research, development, and learning through high-quality publications. A total of 702 articles, published between 2004-2007, were analyzed from the following seven journals. Journal of Technology and Teacher Education (JTATE), Contemporary Issues in Technology and Teacher Education (CITE), AACE Journal (AACEJ), Journal of Educational Multimedia and Hypermedia (JEMH), Journal of Interactive Learning Research (JILR), Journal of Computers in Mathematics and Science Teaching (JCMST), and International Journal on E-Learning (IJEL). The journals and a description of their content and readership are listed in Table 1.

**Table 1**

Information About Journals

| Journal Title | Description of Journal Content | Readership |
|---|---|---|
| Journal of Technology and Teacher Education (JTATE) | Focuses on research in teacher education, preservice and inservice. | Academics, Corporate Researchers |
| Contemporary Issues in Technology and Teacher Education (CITE) | Discusses current issues and methods regarding technology and the preparation of preservice teachers. | Academics |
| AACE Journal (AACEJ) | Covers multiple disciplines within educational technology in regard to the enhancement of teaching and learning. | Administrators, Professors, Researchers, Developers |
| Journal of Educational Multimedia and Hypermedia (JEMH) | Adds to the literature regarding technology integration using images, sound, text and data, all multimedia and hypermedia. | Administrators, Developers, Professors, Researchers |
| Journal of Interactive Learning Research (JILR) | Focuses on the practice of creating interactive learning environments. It covers technology developments and the theory behind best practices in designing effective and dynamic learning environments, perfect for practitioners and researchers in multiple disciplines and education levels. | Academics, Corporate Researchers |
| Journal of Computers in Mathematics and Science Teaching (JCMST) | Provides insight on the practice of using computers in the teaching of mathematics and science in education at all levels. K-20. It is practical in nature, giving its audience ideas on how to enhance STEM learning environments through technology. | Academics, Corporate Researchers |

| International Journal on E-Learning (IJEL) | Focuses on higher education and professional development in corporate settings regarding the use of technology in the enhancement of teaching and learning. The audience includes those who are learning and teaching in healthcare, government, business/corporate, and academic settings. | Researchers, Developers and Practitioners in Corporate, Government, Healthcare and Higher Education |
|---|---|---|

* Information in this table is provided by Cabell and English (2005/2006)

All journals use double blind peer review and are published quarterly with acceptance rates between 11% and 20%. The information that was collected about each article is listed in the code catalog in Appendix 1. For example, the identifying information for the first author was collected, including: (a) gender, (b) institution type, (c) department type, and (d) career status. The code catalog was developed using classifications from Waxman et al. (2002), from their seminal quantitative synthesis of the effectiveness of teaching and learning with technology on student outcomes. In addition, the classification system within the AACE Ed/ITLIB Digital Library (2008) was also used to develop the code catalog. One researcher coded articles. At the start of the process, this researcher conferred with coauthors on modifications to the code book. Within discussions, all discrepancies in coding were resolved. After all articles were coded, a second researcher verified the codes by randomly sampling articles to check data.

Because the AACE journals do not require full identification of the authors within the published journal articles, Google was used to decrease the amount of "Unknown" gender identification. "Unknown" was assigned if the gender of the author was undeterminable to the researchers.

## Analysis

SPSS was used to analyze the data. A probability level of $p < .05$ was set for all tests of statistical significance. Descriptive statistics and frequencies for each category were calculated. chi square was used to determine whether or not there were significant differences among categories/variables. Frequencies (percentages) include "Unknown" data. chi square analysis does not include "Unknown" data in order to compare the differences between the gender data that were positively identified. When chi square was calculated, the degree of freedom was equal to 1; correction was not done for this because the determination of significant difference was not affected. The authors looked at the past four years of publications for seven journals; thus, this analysis is retrodictive rather than predictive. Data were not analyzed per year because the analysis focused on a span of four years.

## Results

### Overall per Journal Data

Each journal is unique in its contents and readership. Tables 2 through 6 highlight data about the articles published in each journal during the time frame of 2004 to 2007. The tables display differences across the journals. Data in the tables are expressed in percentages and include the following:

- Study Type—Information was collected about the type of study the author(s) completed. The categories for coding included the following: Quantitative, Qualitative, Mixed Method, Editorial, Project Description, Project Evaluation, Think Piece, Review, How-To Guide, and Other.
- Education Level of Participant—Information was collected about the education level of the participants in each article's study. The categories for coding included the following: Early Childhood Education (ECE), Elementary Education (EE), Middle, Postsecondary, Secondary, Professional Development, Mixed, and Unknown.
- Participants—Information was collected about the types of participant in each article's study. The categories for coding included the following: Administrators, Students-Adolescents, Students-Adults,

Faculty, Teachers, Preservice Teachers, Mixed, and Unknown.
- Educational Environment—Information was collected about the educational environment of the study's participants. The categories for coding included the following: Classrooms, Library, Museums, Physical Environments, Schools, Virtual Environments, Universities, Mixed, and Unknown.
- Subject Area—Information was collected about the subject areas focused upon in the articles. The categories for coding included the following: Business, Computer Science, Engineering, English/Language Arts, Fine Arts, Health, Health Sciences, Information Sciences, Languages, Mathematics, PE, Sciences, Social Sciences, Social Studies, Mixed, and NA.

**Table 2**

Article Information About Types of Studies

| Study Type | | | | | | | |
|---|---|---|---|---|---|---|---|
| Categories | JTATE | CITE | IJEL | JEMH | JILR | JCMST | AACEJ |
| Quantitative | 30.5 | 5.8 | 28.5 | 32.5 | 25.8 | 34.4 | 7.0 |
| Qualitative | 30.5 | 13.9 | 3.3 | 9.3 | 10.3 | 11.4 | 12.7 |
| Mixed Methods | 11.9 | 8.8 | 7.3 | 11.6 | 12.4 | 25.7 | 2.8 |
| Editorial | 6.8 | 7.3 | 1.6 | 2.3 | 3.1 | - | 1.4 |
| Project Description | 9.3 | 24.1 | 27.6 | 12.8 | 16.5 | 11.4 | 18.3 |
| Project Evaluation | - | 8.0 | 13.8 | 12.8 | 6.2 | 2.9 | 26.8 |
| Think Piece | 5.9 | 12.4 | 9.8 | 10.5 | 17.5 | 1.4 | 7.0 |
| Review | 1.7 | 5.1 | 1.6 | 8.2 | 6.2 | 5.7 | 15.5 |
| How-To Guide | 0.8 | 7.3 | 5.7 | - | 2.0 | 7.2 | 8.5 |
| Other | 2.6 | 7.3 | 0.8 | - | - | - | - |

**Table 3**

Article Information About Education Level of Participants

| Education Level of Participant | | | | | | | |
|---|---|---|---|---|---|---|---|
| Categories | JTATE | CITE | IJEL | JEMH | JILR | JCMST | AACEJ |
| ECE | - | - | - | 1.2 | 1.0 | 1.4 | 1.4 |
| EE | 2.6 | 3.6 | - | 4.7 | 5.1 | 10.0 | 7.0 |
| Middle | 1.7 | 3.6 | - | 5.8 | 6.2 | 10.0 | - |
| Postsecondary | 50.8 | 53.3 | 48.0 | 45.3 | 41.2 | 37.1 | 47.9 |
| Secondary | 1.7 | 4.4 | 1.6 | 2.3 | 5.1 | 17.2 | 7.0 |
| Professional Development | 22.0 | 11.7 | 4.9 | 2.3 | 2.1 | - | 2.8 |
| Mixed | 19.5 | 17.5 | 29.2 | 4.7 | 10.3 | 14.3 | 29.6 |
| Unknown | 1.7 | 5.9 | 16.3 | 33.7 | 28.9 | 10.0 | 4.3 |

**Table 4**

Article Information About Participants

| Participants | | | | | | | |
|---|---|---|---|---|---|---|---|
| Categories | JTATE | CITE | IJEL | JEMH | JILR | JCMST | AACEJ |
| Administrators | - | - | - | 1.2 | - | - | 1.4 |
| Students–Adolescents | - | 9.5 | 0.8 | 16.3 | 13.4 | 42.9 | 18.3 |
| Students–Adults | 4.2 | 4.4 | 39.0 | 43.0 | 38.2 | 24.3 | 32.4 |
| Faculty | 8.5 | 2.2 | 3.3 | 1.2 | - | - | 4.2 |
| Teachers | 22.0 | 8.0 | 0.8 | - | 4.1 | 2.8 | 1.4 |
| Preservice Teachers | 40.7 | 50.4 | - | 2.3 | 1.0 | 7.1 | 11.3 |
| Mixed | 21.2 | 17.5 | 38.2 | 3.5 | 13.4 | 12.9 | 22.5 |
| Unknown/NA | 3.4 | 8.0 | 17.9 | 32.5 | 29.9 | 10.0 | 8.5 |

**Table 5**

Article Information About Educational Environment

| Educational Environment | | | | | | | |
|---|---|---|---|---|---|---|---|
| Categories | JTATE | CITE | IJEL | JEMH | JILR | JCMST | AACEJ |
| Classrooms | 12.7 | 10.9 | 1.6 | 12.8 | 14.4 | 44.3 | 4.2 |
| Library | - | - | - | - | - | - | - |
| Museums | - | - | - | 1.2 | - | - | - |
| Physical Environments | 0.8 | - | 0.8 | - | 2.1 | - | - |
| Schools | 8.5 | 6.6 | 0.8 | 3.5 | 1.0 | 1.4 | 12.7 |
| Virtual Environments | 5.1 | 5.1 | 12.2 | 5.8 | 7.2 | - | 4.2 |
| Universities | 53.4 | 56.2 | 44.7 | 38.4 | 40.2 | 30.0 | 46.5 |
| Mixed | 16.1 | 16.1 | 25.2 | 6.9 | 6.2 | 11.4 | 28.2 |
| Unknown | 3.4 | 5.1 | 14.7 | 31.4 | 28.9 | 12.9 | 4.2 |

**Table 6**

Article Information About Subject Areas

| Subject Areas | | | | | | | |
|---|---|---|---|---|---|---|---|
| Categories | JTATE | CITE | IJEL | JEMH | JILR | JCMST | AACEJ |
| Business | - | - | 6.5 | 2.3 | 6.2 | - | 1.4 |
| Computer Science | 1.7 | - | 3.3 | 2.3 | 11.3 | 14.3 | 1.4 |
| Engineering | - | 0.7 | 0.8 | 3.5 | - | 2.9 | 2.8 |
| English/Language Arts | 1.7 | 12.4 | 2.5 | 1.2 | 1.0 | - | - |
| Fine Arts | - | - | 0.8 | 1.2 | - | - | - |
| Health | - | - | - | - | - | - | - |
| Health Sciences | - | - | 1.6 | 3.5 | 2.1 | - | 1.4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Information Sciences | - | - | 0.8 | 3.5 | - | - | - |
| Languages | 1.7 | 0.7 | - | 2.3 | 1.0 | - | 4.2 |
| Mathematics | 3.4 | 12.4 | 0.8 | - | 3.1 | 50.0 | 4.2 |
| PE | - | 0.7 | - | - | - | - | - |
| Sciences | 5.9 | 9.5 | 1.6 | 10.4 | 7.2 | 30.0 | 2.8 |
| Social Sciences | - | - | 1.6 | 2.3 | 2.1 | - | - |
| Social Studies | 0.8 | 12.4 | - | 1.2 | 1.0 | - | 1.4 |
| Mixed | 77.1 | 45.3 | 61.8 | 31.4 | 36.1 | 1.4 | 79.0 |
| NA | 7.7 | 5.9 | 17.9 | 34.9 | 28.9 | 1.4 | 1.4 |

The shaded regions of the table display interesting trends across the journal data:

- In five out of the seven journals, a majority of the authors used quantitative methods. This contradicts the literature by Taylor (2001) who reported a decrease in the quantity of quantitative submissions in the Adult Education Quarterly (AEQ) from 1989, 45.2%, to 1999 (34.1%), respectively.
- The majority of articles in all journals are focusing on postsecondary research. This shows a deficit in research on K-12 education in the AACE journals.
- The majority of the participants in six of the seven journals were either preservice teachers or adult students. This trend corresponds with the data about the educational environment where the majority of the studies are being conducted in the university setting.

## Gender Differences

The rest of the results section concentrates on gender differences within the data.

*Overall.* In regard to the overall first author gender, there is a significant difference (chi square [$df=1$, $n=660$] = 4.10, $p < .05$) between the number of men (356, 50.7%) and women (304, 43.3%) who are first authors.

This finding is in keeping with gender representation in literature across academia. In recent years, the trend is for women to be more equally repre-

sented in academic fields and literature. In a content analysis of the *Adult Education Quarterly* from 1989 to 1999, Taylor (2001) reported a trend in the percentage of women publishing in 1989 (28%) and 1999 (36.4%). Despite the noted increase, Taylor pointed out that single author men within the academic profession from the U.S., conducting quantitative research, "dominated the submissions" (p. 335).

*Per journal.* There is a significant difference (chi square [$df$ = 1, $n$=113] = 3.90, $p < .05$) in the number of women (67, 56.8%) who are first authors in JTATE as compared to men (46, 39%). Seeing as how teacher education is a majority of women (NCES, 2005a), this finding is not surprising. However, no significant difference (chi square [$df$ = 1, $n$=136] = 0.00, $p > .05$) occurred in the number of women (68, 49.6%) who are first authors in CITE as compared to men (68, 49.6%). Both of these journals have a teacher education focus. About the same number of women are publishing in CITE as compared to JTATE, but there are more men publishing in CITE as compared to JTATE. This difference in pattern may have to do with CITE's focus on contemporary issues, including theorizing or philosophizing on a given topic. Providing insight into this are Belenky, Clinchy, Goldberger, and Tarule (1997), who are well known in the area of women's ways of knowing. Belenky et al. (1997) suggested that men are comfortable with the idea of "separate knowing" in which there is no need for tight connectedness between their thoughts, whereas women are comfortable with "connected knowing" that concentrates on defined connections between ideas. The fact that CITE is an electronic journal may also be a factor in the differences that were found.

Also in the Per Journal data, a significant difference (chi square [$df$ = 1, $n$=113] = 9.64,      $p < .05$) occurred in the number of women (40, 32.5%) who are first authors in IJEL as compared to men (73, 59.3%). Why are more men interested in publishing about e-learning as compared to women? According to Gokhale and Stier (2004), women prefer heightened classroom interaction, which could result in a lack of interest in e-learning and its related literature. Weinberger (2004) confirmed that women cherish a more socially-involved research environment, and women feel as though they can't find that connection within the computer-related fields.

The last finding of note in the Per Journal data was that no significant difference (chi square [$df$ = 1, $n$=67] = 2.52, $p > .05$) was detected in the number of women (27, 38.6%) who are first authors in JCMST as compared to men (40, 57.1%). This finding, while not significant, does show that there are still more men publishing about science, technology, engineering, and mathematics (STEM) research as compared to women.

*International representation.* There is a significant difference (chi square [$df$=1, $n$=228] = 15.79, $p < .001$) in the number of male (144, 56.5%) first authors who represent international universities as compared to women (84, 32.9%). This finding has an implication for the AACE. As an international organization, the association should more actively recruit authors internationally, specifically female authors, in order to present a balance of perspectives. This imbalance could also be explained by the fact that there are country-specific journals, such as the *Australasian Journal of Educational Technology,* in which many women may publish. In addition, as Carter (2004) pointed out, women in other countries also experience gender stereotyping, for example, sex typing, and this may affect the number of international women who submit to AACE journals. This data is also skewed in regard to AACE's SITE Conference whose participants originate from about 80 countries each year. AACE may want to purposefully solicit quality conference presentations from international schools and, in particular, from international women scholars.

*Career status.* There is a significant difference (chi square [$df$=1, $n$=139] = 12.09, $p< .001$) in the number of full professors who are men (90, 64.3%) first authors as compared to women (49, 35%). This finding contrasts with the finding that there was no significant difference for either of the assistant (Women – 98, 54.7%; Men – 78, 43.6%; chi square [$df$=1, $n$=176] = 2.27, $p > .05$) or associate level professors (Women – 66, 42.3%; Men – 88, 56.4%; chi square [$df$=1, $n$=154] = 3.14, $p > .05$). This indicates that women are not awarded full professorships in Educational Technology as often as men.

The low representation of administrators and K-12 employees is another noteworthy trend in AACE publications. A possible explanation is that they are publishing in International Society for Technology in Education (ISTE) or other online journals that are easily accessible to their audiences, that is, K-12 educators. In addition, K-12 representatives, if not accepted the first time, may not have the time to resubmit. As Biggs (1990) pointed out, publishing success is a matter of persistence and whether the author has the drive to keep trying in the face of initial rejection.

*Study type.* While there is a significant difference (chi square [$df$=1, $n$=89] = 4.96, $p < .05$) in the number of women (55, 58.5%) first authors who use qualitative methods as compared to men (34, 36.2%), there is no significant difference (chi square [$df$=1, $n$=149] = 1.94, $p > .05$) in the number of men (83, 51.6%) first authors who use quantitative methods as com-

pared to women (66, 41%). In light of recent literature, these findings are noteworthy. The focus on qualitative methods by women has been studied, and it is found that women find qualitative methods more meaningful and revealing to their research (Miller & Treitel, 1991). In 2002, the National Research Council called for "scientifically based research" that can be generalized to a greater population than the one being studied. Following this call, Thompson (2005) emphasized, "Both qualitative and quantitative methodologies are needed to provide scientifically based evidence for the technology in teacher education community" (p. 333). Reiterating this notion are Dawson and Ferdig (2006) who stressed the importance of using mixed methods. Rourke and Szabo (2002) reported the majority of the authors who wrote for the *Journal of Distance Education* were interested in qualitative and mixed methods over quantitative methods. Is this a positive or negative trend for equalizing gender balance? If this finding follows the literature, more qualitative research is being published, and women tend to publish qualitative research more than quantitative; thus, if more qualitative research is being published, the gender balance could be aided by this trend.

There is a significant difference (chi square [$df$=1, $n$=63] = 4.59, $p <$ .05) in the number of men (40, 58.8%) first authors who write think pieces as compared to women (23, 33.8%). This finding reiterates what Belenky et al. (1997) said about women being connected knowers, where truth is "personal, particular, and grounded in firsthand experience" (Belenky et al., 1997, p. 113). Think pieces are platforms for examining contemporary issues in a theoretical way. Men may choose to do this type of writing because of their comfort with making connections with distant ideas. In Educational Technology, this finding indicates a deficit of women's viewpoints in theoretical literature.

*Place of employment.* There is a significant difference (chi square [$df$=1, $n$=206] = 9.40, $p < .01$) in the number of men (125, 57.3%) first authors representing noneducation departments as compared to women (81, 37.2%). Aligned with the literature review, these data show that noneducation fields are dominated by men. This finding has implications for AACE solicitation of women in noneducation fields. Although there is a lack of female first authors in noneducation departments, the interdisciplinary nature of educational technology is evident in these data.

*Participants.* There is a significant difference (chi square [$df$=1, $n$=152] = 4.45, $p < .05$) in the number of men (89, 51.4%) first authors who choose to write articles about adult students as compared to women (63, 36.4%).

This finding matches the idea of women being employed more than men in K-12 areas and male overrepresentation in the higher education realm. It also supports the fact that there are fewer women publishing in IJEL, because it focuses less on K-12 concerns as compared to JTATE.

There is a significant difference (chi square [$df$=1, $n$=132] = 4.34, $p <$ .05) in the number of women (78, 58.6%) first authors who choose to write articles about preservice teachers as compared to men (54, 40.6%). These data match the results for gender data regarding JTATE, where the majority of first authors are women.

### Additional Data

*Journal type.* The seven journals were categorized under three topics and data were reanalyzed. The three topics were "Teacher Education Journals," "Broad Educational Technology Journals," and "Content-Specific Journal." The "Teacher Education Journals" include CITE and JTATE. The "Broad Educational Technology Journals" include AACEJ, JILR, IJEL, and JEMH. The "Content-Specific Journal" is JCMST.

There is a significant difference (chi square [$df$=1, $n$=344] = 10.47, $p$ <.01) in the number of men (202, 53.6%) first authors who published in "Broad Educational Technology Journals" as compared to women (142, 37.7%). This finding shows that women tend to write less in the broad journals as compared to the "Teacher Education Journals." Referring back to the literature presented, data confirm that education is one of few fields that are female-dominated.

*Subject area.* The thirteen subjects of the articles were divided into three subject areas:

1.Business Sciences—Business and Information Sciences

2.Social Sciences—Social Studies, Social Sciences, Languages, English/Language Arts, and Fine Arts

3.Natural Sciences—Computer Science, Engineering, Health, Health Sciences, Mathematics, and Sciences

There is a significant difference (chi square [$df$=1, $n$=160] = 9.03, $p <$ .01) in the number of men (99, 57.9%) first authors who write about the natural sciences fields as compared to women (61, 35.7%). This finding aligns with the NCES (2005a) data that reported STEM field domination by men.

## DISCUSSION

There is a significant difference (chi square [$df = 1$, $n = 660$] = 4.10, $p <$ .05) between the number of men (356, 50.7%) and women (304, 43.3%) first authors within seven AACE journals. While these results are not as profound as expected, there are at least four possible explanations for this difference. First, it would be revealing to know the number of women and men first authors whose manuscripts were rejected from the AACE journals. Our content analysis only includes articles that were accepted and published in the AACE journals; it does not include items that were submitted and rejected. Such information may provide a more complete picture of authorship trends (Hernon, Smith, & Croxen, 1993; Zamora & Adamson, 1982).

Second, acceptance rates for AACE journals are relatively low when compared to other journals (Henson, 1997) and women may intentionally or unintentionally avoid possible rejection by submitting elsewhere. Third, according to Singh, Allen, Scheckler, and Darlington (2007), "there are important familial, educational, and societal dimensions that are related to the problem of women's participation in computing fields" (p. 502). Since there tend to be fewer women working in institutions where refereed publications are used as important criteria for promotion, tenure and merit, women may not be as motivated to publish as men. Fourth, there may simply be fewer women working in the field of Educational Technology. Unfortunately, there are no data that specifically explore women's representation in the field, although data discussed earlier suggest women should be equally represented.

## CONCLUSIONS

Many other intangible factors may also contribute to the differences between men and women first authors published in AACE journals (Maher et al., 2004; Cohoon, 2006), however, these journals are at least respectable in terms of female representation. Motivation to publish generally relates to where people work and what their career goals are. One research report showed that men represented the majority (67.4%) of faculty in public doctoral institutions (Ivey, Weng, & Vahadji, 2005). This suggests that fewer women see research universities as their career goal. Moreover, given the importance of sharing experiences and research to increase the pool of knowledge in educational technology (Hawkridge, 1999), it is important for our field to intentionally strive to equalize the gender gap. In addition, it is

important for other researchers to analyze the literature published by other professional associations such as the International Society for Technology in Education (ISTE) and the Association for Educational Communications and Technology (AECT) to complete the picture of female representation in Educational Technology started by this study.

## References

AACE. (2008). *Classifications used in the Ed/ITLIB Digital Library*. Retrieved June 4, 2008, from http://www.editlib.org/index.cfm?CFID=6165918&CFT OKEN=50624104&fuseaction=Reader.BrowsePapersByTopic

Abedi, J., & Benkin, E. (1987). The effects of students' academic, financial, and demographic variables on time to the doctorate. *Research in Higher Education, 27*(1), 3-14.

Aisenberg, N., & Harrington, M. (1988). *Women of academe: Outsiders in the sacred grove*. Amherst, MA: University of Massachusetts Press.

Astin, H., & Snyder, M.B. (1982). Affirmative action 1972-1982—A decade of response. *Change, 14*(5), 26-31.

Bach, R.L., & Perrucci, C.C. (1984). Organizational influences on the sex composition of college and university faculty: a research note. *Sociology of Education, 57*, 193-198.

Baird, L. L. (1997). Completing the dissertation: Theory, research and practice. *New Directions for Higher Education, 25*(3), 99-105.

Belenky, M.F., Clinchy, B.M., Goldberger, N.R., & Tarule, J.M. (1997). *Women's ways of knowing: The development of self, voice and mind.* (Tenth anniversary edition.) New York: Basic Books.

Bellas, M.L. (1994). Comparable worth in academia: The effects on faculty salaries of the sex composition and labor market conditions of academic disciplines. *American Sociological Review, 59*, 807-821.

Biggs, M. (1990). The impact of peer review on intellectual freedom. *Library Trends, 39*, 145-167.

Bjorkman, C., Christoff, I., Palm, F., & Vallin, A. (1998). Exploring the pipeline: Towards an understanding of the male dominated computing culture and its influence on women. *SIGCSE Bulletin, 30*(2), 64-69.

Bowen, W. G., & Rudenstine, N. L. (1992). *In pursuit of the Ph.D*. Princeton, NJ: Princeton University Press.

Bowen, H.R., & Schuster, J.H. (1986). *American professors: A national resource imperiled*. New York: Oxford University Press.

Bradburn, E.M., & Sikora, A. (2002). *Gender and racial/ethnic differences in salary and other characteristics of postsecondary faculty: Fall 1998*. Postsecondary Education Descriptive Analysis Reports: Executive Summary. National Center for Education Statistics. Retrieved May 30, 2008, from http://nces.ed.gov/das/epubs/2002170/gender.asp

Cabell, D.W.E., & English, D.L. (Eds.). (2005/2006). *Cabell's directory of publishing opportunities in educational curriculum and methods* (7th ed.). Beaumont, TX: Cabell.

Carter, P.A. (2004). Education for work as human rights for women: A feminist analysis. In R.D. Lakes & P.A. Carter (Eds.), *Globalizing education for work: Comparative perspectives on gender and the new economy* (pp. 19-42). Mahwah, NJ: Lawrence Erlbaum.

Cohoon, J.M. (2006). Just get over it or just get on with it: Retaining women in undergraduate computing. In J.M. Cohoon & W. Aspray (Eds.), *Women and information technology: Research on underrepresentation* (pp. 205-237). Cambridge, MA: MIT Press.

Commission on Professionals in Science and Technology. (2004). STEM workforce data project. Report No. 2. *Women in science and technology: The Sisyphean challenge of change*. Retrieved May 31, 2008, from http://206.67.48.105/STEM/STEM2_Report.pdf

Dawson, K., & Ferdig, R. E. (2006). Commentary: Expanding notions of acceptable research evidence in educational technology: A Response to Schrum et al. *Contemporary Issues in Technology and Teacher Education, 6*(1). Retrieved May 28, 2008, from http://www.citejournal.org/vol6/iss1/general/article2.cfm

Foley, A.L., Keener, P.G., & Branch, R.C. (1994). Women's contributions to instructional-technology journals. *Educational Technology Research and Development, 42*(2), 55-62.

Fox, M.F. (1981). Sex, salary and achievement: Reward-dualism in academia. *Sociology of Education, 54*, 71-84.

Glover, D., & Parsad, B. (2003). The gender and racial/ethnic composition of postsecondary instructional faculty and staff: 1992-1998. *Education Statistics Quarterly, 4*, 113-126.

Gokhale, A.A., & Stier, K. (2004). Closing the gender gap in technical disciplines: An investigative study. *Journal of Women and Minorities in Science and Engineering, 10*, 149-150.

Hawkridge, D. (1999). Thirty years on, BJET! and educational technology comes of age. *British Journal of Educational Technology, 30*(4), 293-304.

Hearn, J. C., & Olzak, S. (1981). The role of college major departments in the reproduction of sexual inequality. *Sociology of Education, 54*(3), 195–205.

Henson, K. (1997). Writing for publication. *Phi Delta Kappan, 78*, 781-784.

Hernon, P., Smith, A., & Croxen, M.B. (1993). Publication in college and research libraries: Accepted, rejected, and published papers, 1980-1991. *College and Research Libraries, 54*, 303-321.

Hurlbert, J.S., & Rosenfeld, R.A. (1992). Getting a good job: Rank and institutional presetige in adademic psychologists' careers. *Sociology of Education, 65*(3), 188-207.

Ivey, E., Weng, C. F., & Vahadji, C. (2005). *Gender differences among contingent faculty: A literature review*. Retrieved May 31, 2008, from http://www.awis.org/pubs/sloanreport.pdf

Jackson, S.A. (2006). *Mr. President, spark a legacy of innovation*. Retrieved May 31, 2008, from Rensselaer Polytechnic Institute Web site http://rpi.edu/web/Campus.News/inthenews/Oped.pdf

Jacobs, J.A. (1996). Gender inequality and higher education. *Annual Review of Sociology, 22*, 153-185.

Konrad, A.M., & Pfeffer, J. (1991). Understanding the hiring of women and minorities in educational institutions. *Sociology of Education, 64*, 141-157.

Langton, N., & Pfeffer, J. (1994). Paying the professor: Sources of salary variation in academic labor markets. *American Sociological Review, 59*, 236-256.

Long, J.S., Allison, P.D., & McGinnis, R. (1993). Rank advancement in academic careers: Sex differences and the effects of productivity. *American Sociological Review, 58*, 703-722.

Long, J.S., & Fox, M.F. (1995). Scientific careers: Universalism and particularism. *Annual Review of Sociology, 21*, 45-71.

Maher, M.A., Ford, M.E., & Thompson, C.M. (2004). Degree progress of women doctoral students: Factors that constrain, facilitate and differentiate. *The Review of Higher Education, 27*(3), 385-408.

Margolis, J., & Fisher, A. (2002). *Unlocking the clubhouse: Women in computing*. Cambridge, MA: MIT Press.

Miller, C., & Treitel, C. (1991). *Feminist research methods*. New York: Greenwood.

National Center for Education Statistics. (2005a). *Bachelor's, master's, and doctor's degrees conferred by degree-granting institutions, by sex of student and field of study: 2004–05*. (NCES 2005-258). Retrieved May 28, 2008, from http://nces.ed.gov/programs/digest/d06/tables/dt06_258.asp

National Center for Education Statistics. (2005b). *Number of persons age 18 and over, by highest level of education attained, age, sex, and race/ethnicity*. Retrieved May 28, 2008, from http://nces.ed.gov/programs/digest/d07/tables/dt07_009.asp

National Center for Education Statistics. (2005c). *Postsecondary institutions in the United States: Fall 2003 and degrees and other awards conferred: 2002-2003*. (NCES 2005-154). Retrieved May 28, 2008, from http://nces.ed.gov/pubs2005/2005154.pdf

National Center for Women & Information Technology. (2005). Retrieved May 31, 2008, from http://www.ncwit.org

National Research Council. (2002). Scientific research in education: Report of a workshop. In L. Towne, R. J. Shavelson, & M. J. Feuer (Eds.), *Committee of scientific principles in education research*. Washington, DC: National Academy Press.

National Science Foundation, Division of Science Resources Statistics. (2007, February). *Women, minorities, and persons with disabilities in science and engineering: 2007* (NSF 07-315). Retrieved May 31, 2008, from http://www.nsf.gov/statistics/wmpd

Randall, C., Price, B., & Reichgelt, H. (2003). Women in computing programs: Does the incredible shrinking pipeline apply to all computing programs? *Inroads: The SIGCSE Bulletin, 35*(4), 55-59.

Rosenfeld, R.A. (1987). Patterns and effect of geographic mobility for academic women and men. *Journal of Higher Education, 58*(5), 493-515.

Rourke, L., & Szabo, M. (2002). A content analysis of the Journal of Distance Education 1986-2001. *Journal of Distance Education, 17*(1), 63-74.

Singh, K., Allen, K.R., Scheckler, R., & Darlington, L. (2007). Women in computer-related majors: A critical synthesis of research and theory from 1994 to 2005. *Review of Educational Research, 77*(4), 500-533.

Smith, B. (1995, April). *Hidden rules, secret agendas: Challenges facing contemporary women doctoral students*. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco.

Tack, M.W., & Patitu, C.I. (1992). *Faculty job satisfaction: Women and minorities in peril*. (ERIC Document Reproduction Service No. ED355859)

Taylor, E.W. (2001). Adult education quarterly from 1989 to 1999: A content analysis of all submissions. *Adult Education Quarterly, 51*(4), 322-340.

Thomas, K. (1990). *Gender and subject in higher education*. Bristol, PA: Taylor and Francis.

Thompson, A.D. (2005). Scientifically based research: Establishing a research agenda for the technology in teacher education community. *Journal of Research on Technology in Education, 37*(4), 331-337.

Tolbert, P.S. (1986). Organizations and inequality: Sources of earnings differences between male and female faculty. *Sociology of Education, 59*, 227-235.

Tolbert, P.S., & Oberfield, A.A. (1991). Sources of organizational demography: Faculty sex ratios in colleges and universities. *Sociology of Education, 64*, 305-315.

Tolbert, P.S., Simmons, T., Andrews, A., & Rhee, J. (1995). The effects of gender composition in academic departments on faculty turnover. *Industrial and Labor Relations Review, 4893*, 562-579.

Tuckman, H., Coyle, S., & Bae, Y. (1990). *On time to the doctorate*. Washington, DC.: National Academy Press.

Ward, K., & Grant, L. (1995). Gender and academic publishing. In A. Bayer & J. Smart (Eds.), *Higher education: Handbook of theory and research* (pp. 172-222). New York: Agathon.

Waxman, H.C., Connell, M.L., & Gray, J. (2002). *A quantitative synthesis of recent research on the effects of teaching and learning with technology on student outcomes*. Naperville, IL: North Central Regional Educational Laboratory. Retrieved May 13, 2008, from http://www.coe.ufl.edu/Courses/eme5054/Foundations/Articles/waxman.pdf

Weinberger, C.J. (2004). Just ask! Why surveyed women did not pursue IT courses or careers. *IEEE Technology and Society Magazine, 23*(2), 28-35.

Wilson, K. M. (1965). *Of time and the doctorate: Report of an inquiry in the duration of doctoral study*. Atlanta: Southern Regional Education Board.

Zamora, G.J., & Adamson, M.C. (1982). Authorship characteristics in special libraries: A comparative study. *Special Libraries, 73*, 100-107.

**Appendix 1**

Code Catalog

    Journal
        * JTATE
        * AACEJ
        * JCMST
        * CITE
        * JILR
        * JMEH
        * IJEL

    Year
        * 2004
        * 2005
        * 2006
        * 2007

    Volume, Issue Number, Article Number (varied per journal)

    Author1, Author2, Author3
        * Male
        * Female
        * Unknown

    Department1, Department2, Department3
        * College of Education
        * K-12
        * Other
        * Unknown

    UniversityType1, UniversityType2, UniversityType3
        * Doctoral
        * Masters
        * Undergraduate

* Community College
* K-12
* Business & Industry
* Other
* Unknown

Career1, Career2, Career3
* Graduate Student
* Doctoral Student
* Post Doc
* Asst. Professor
* Assoc. Professor
* Full Professor
* Non-tenure
* Administrator
* K-12
* Other
* Unknown

AAU
* Yes
* No
* NA

International
* Yes
* No
* NA

StudyType
* Quantitative
* Qualitative
* Mixed Method
* Editorial
* Project Description
* Project Evaluation
* Think Piece
* Review
* How-to Guide
* Other

Education level of participants in article
      * ECE
      * EE
      * Middle School
      * Post Secondary
      * Secondary
      * Professional Development
      * Mixed
      * Unknown

Educational environment where article is set

      * Classrooms
      * Library
      * Museums
      * Physical Environments
      * Schools
      * Virtual Environments
      * Universities
      * Mixed
      * Unknown/NA

Participants that were written about in article
      * Administrators
      * Students - Adolescents
      * Students - Adults
      * Faculty
      * Teachers
      * Preservice Teachers
      * Mixed
      * Unknown/NA

Subject area
      * Business
      * Computer Science
      * Engineering
      * English/Language Arts
      * Fine Arts
      * Health

* Health Sciences
* Information Sciences
* Languages
* Mathematics
* PE
* Sciences
* Social Sciences
* Social Studies
* Mixed
* NA